SPACE STATION OBSERVATIONS OF TROPICAL CIRRUS MEETING A CRITICAL CLIMATE NEED

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Clouds are key to defining the Earth's energy balance. They can cool the Earth by reflecting sunlight back to space and they can warm the Earth by absorbing upwelling thermal radiation. A cloud's ability to heat or cool is a function of its altitude, water content, and distribution of crystal or droplet sizes. Tropical cirrus, in particular, produce strong radiative effects due to their particularly cold temperatures, high altitudes, and large spatial extent. The lack of a technique to quantify the microphysical and radiative properties of cirrus is a major source of uncertainty in global climate and greenhouse warming calculations. This observational deficiency leaves important global climate measurement needs unmet. New measurement techniques such as submillimeter-wavelength cloud ice radiometry are under development at NASA to fill this critical gap. Submillimeter-wave radiometry relies on passive measurements of natural atmospheric radiation to characterize the microphysical and radiative properties of cirrus. The required instrumentation is lightweight, low-powered, and compact. The opportunity to site this instrument on the space station with its low-inclination orbit will both complement existing radiation sensors and enable the capability to characterize and monitor tropical cirrus satisfying critical climate modeling needs.

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